

## CLAIMS

I claim:

1. A circuit board, comprising:

a matrix material; and

an optical fiber integrated with the matrix material.

2. The circuit board of claim 1, wherein the optical fiber integrated with the matrix material is embedded within the matrix material.

3. The circuit board of claim 2, wherein the matrix material comprises:

a first layer; and

a second layer; and

wherein the optical fiber is between the first layer and the second layer.

4. The circuit board of claim 3, wherein the optical fiber is part of an optical fiber pattern with a plurality of optical fibers and the optical fiber pattern is between the first layer and the second layer.

5. The circuit board of claim 4, wherein the optical fibers in the optical fiber pattern have preselected locations within the optical fiber pattern.

6. The circuit board of claim 5, wherein the optical fibers in the optical fiber pattern are in a grid pattern with preselected spacings between the optical fibers that make up the grid.

7. The circuit board of claim 2, wherein:

the matrix material includes a layer with a plurality of woven structural fibers;

and

4 the optical fiber is woven with the structural fibers to form the layer.

1 8. The circuit board of claim 7, wherein:

2 the layer with a plurality of woven structural fibers is a composite layer of woven  
3 fiberglass bundles and resin; and  
4 the optical fiber is woven into the layer as part of one of the bundles.

1 9. The circuit board of claim 8, wherein:

2 a plurality of woven fiberglass bundles each include an optical fiber within the  
3 bundle; and  
4 the optical fibers within the bundles are substantially at a known preselected  
5 location within the circuit board.

1 10. The circuit board of claim 2, wherein the structural layer comprises  
2 fiberglass and resin.

1 11. The circuit board of claim 1, further comprising:

2 a first optical component connected to the matrix material to transmit optical  
3 signals via the optical fiber; and  
4 a second optical component to receive the optical signals transmitted by the first  
5 optical component via the optical fiber.

1 12. The circuit board of claim 1, further comprising:

2 a first electronic component connected to the matrix material to output electronic  
3 signals;  
4 an electrical to optical converter connected to the matrix material to receive  
5 electronic signals from the first electronic component and to transmit  
6 optical signals via the optical fiber;

7 an optical to electrical converter connected to the matrix material to receive the  
8 transmitted optical signals from the optical fiber and to convert the  
9 optical signals to electrical signals; and  
10 a second electronic component to receive the electrical signals from the optical to  
11 electrical converter.

1 13. The circuit board of claim 12, wherein the electrical to optical converter  
2 is a separate component from the first electronic component.

1 14. The circuit board of claim 12, wherein the electrical to optical converter  
2 is part of the first electronic component.

1 15. A method to form a printed circuit board, comprising:  
2 forming a stack that includes a first layer, a second layer, and a pattern of optical  
3 fibers between the first and second layers; and  
4 curing the stack to form the printed circuit board, wherein the pattern of optical  
5 fibers are between the first and second layers in the circuit board.

1 16. The method of claim 15, wherein the first and second layers are prepreg  
2 fiberglass layers.

1 17. The method of claim 15, wherein the optical fibers in the pattern of  
2 optical fibers have preselected locations within the optical fiber pattern.

1 18. The method of claim 17, wherein the optical fibers in the pattern of  
2 optical fibers have preselected locations within the pattern of optical fibers.

1 19. The method of claim 18, wherein the optical fibers in the pattern of  
2 optical fibers are in a grid pattern with preselected spacings between the optical fibers  
3 that make up the grid.

1           20.     A method to form a printed circuit board, comprising:  
2           forming a plurality of fiber bundles, each fiber bundle comprising structural  
3                       fibers and at least one of the plurality of fiber bundles further  
4                       comprising an optical fiber;  
5           weaving the plurality of fiber bundles into a structural fabric;  
6           impregnating the structural fabric with resin; and  
7           curing the impregnated structural fabric to form the printed circuit board.

1           21.     The method of claim 20, wherein:  
2           each of the plurality of woven fiberglass bundles includes an optical fiber within  
3                       the bundle; and  
4           the optical fibers within the bundles are substantially at a known preselected  
5                       location within the circuit board.

1           22.     The method of claim 20, wherein:  
2           the cured impregnated structural fabric is a first layer of the printed circuit board;  
3                       and  
4           the printed circuit board has a plurality of layers.

1           23.     The method of claim 22, further comprising:  
2           forming a stack that includes the first layer, a second layer, and a pattern of  
3                       optical fibers between the first and second layers; and  
4           curing the stack to form the printed circuit board, wherein the pattern of optical  
5                       fibers are between the first and second layers in the circuit board.